

WHAT IS CLAIMED IS:

[Claim 1] A device for judging the type of liquid inside a container, comprising:

a plate capacitor, having two plate electrodes positioned in opposing manner; and

a container supporting means, holding, in a region besides the region sandwiched by said two plate electrodes, a non-conductive container that can contain a liquid in the interior thereof;

and judging the type of liquid inside the container by detecting the capacitance of said capacitor or the oscillation frequency of an oscillation circuit containing said capacitor.

[Claim 2] A device for judging the type of liquid inside a container, comprising:

a plate capacitor, having two plate electrodes positioned in opposing manner;

a container supporting means, holding, in a region besides the region sandwiched by said two plate electrodes, a non-conductive container that can contain a liquid in the interior thereof; and

a third electrode, besides said two plate electrodes, that is an electrode outside said container and is set along a portion of said container at which said liquid inside said

container is retained due to gravity;

and judging the type of liquid inside the container by detecting the capacitance of said capacitor or the oscillation frequency of an oscillation circuit containing said capacitor.

[Claim 3] The device for judging the type of liquid inside a container according to Claim 2, wherein said third electrode is a plate electrode or a line electrode, which is positioned along a surface that is a flat surface perpendicular to said plate capacitor and contacts an outer side of said container.

[Claim 4] The device for judging the type of liquid inside a container according to Claim 3, wherein said third electrode moves to an outer surface of said container upon detection of said container being positioned on said container supporting means or in linkage with said container being positioned on said container supporting means.

[Claim 5] The device for judging the type of liquid inside a container according to any one of Claims 2 through 4, having either

a first arrangement, wherein the voltage of said third electrode differs in either or both of the absolute value and the phase with respect to the voltage of a first plate electrode that is positioned at said container side of said capacitor, or

a second arrangement, wherein the voltage of said the third electrode is equal in voltage to the second plate electrode of said capacitor that opposes said first plate electrode.

[Claim 6] The device for judging the type of liquid inside a container according to any one of Claims 1 through 5, wherein said container supporting means adjusts, in accordance with the size of said container, the distance to said container from a first plate electrode, which, among said two plate electrodes, is positioned at the side of said container.

[Claim 7] The device for judging the type of liquid inside a container according to Claim 6, wherein said container has a cylindrical column or rectangular column outer shape and is supported on said container supporting means with the columnar direction of said cylindrical column or rectangular column being set parallel to said first plate electrode, and

said container supporting means has two stairs-like members, which rise in a direction perpendicular to said first plate electrode and are positioned opposite each other, and the distance between said container and said first plate electrode is adjusted according to the size of said container by an outer peripheral surface of said cylindrical column or rectangular column container contacting steps or edge parts of steps of said two stairs-like members.

[Claim 8] The device for judging the type of liquid inside a container according to Claim 7, wherein a step member is positioned at one side of said steps that extend in said columnar direction, and

a container, which is larger than said container that contacts the steps of said two stairs-like members at its outer peripheral surface, is increased in the average distance to said first plate electrode by one end thereof being raised by said step member.

[Claim 9] The device for judging the type of liquid inside a container according to Claim 6, wherein said container has a cylindrical column, rectangular column, or spherical outer shape and is supported on said container supporting means with the columnar direction of said cylindrical column or rectangular column being set perpendicular to said first plate electrode, and

said container supporting means has a structure that is surrounded by stairs-like members, which rise in a direction perpendicular to said first plate electrode, and the distance between said container and said first plate electrode is adjusted according to the size of said container by the bottom surface of said rectangular column or cylindrical column container contacting steps of the stairs-like members or the outer

peripheral surface of said spherical shape container contacting edge parts of said steps.

[Claim 10] The device for judging the type of liquid inside a container according to Claim 6, wherein said container has a cylindrical column or rectangular column outer shape and is supported on said container supporting means with the columnar direction of said cylindrical column or rectangular column being set parallel to said first plate electrode, and

said container supporting means has a groove, having an opening in a direction perpendicular to said first plate electrode and a V-shaped cross section, and the distance between said container and said first plate electrode is adjusted according to the size of said container by an outer peripheral surface of said cylindrical column or rectangular column container contacting surfaces of said V-shaped groove.

[Claim 11] The device for judging the type of liquid inside a container according to Claim 6, wherein said container has a cylindrical column, rectangular column, or spherical outer shape and is supported on said container supporting means with the columnar direction of said cylindrical column or rectangular column being set perpendicular to said first plate electrode, and

said container supporting means has a conical opening

in a direction perpendicular to said first plate electrode, and the distance between said container and said first plate electrode is adjusted according to the size of said container by a bottom surface edge part of said rectangular column or cylindrical column container or the outer peripheral surface of said spherical shape container contacting wall surfaces of said conical opening.

[Claim 12] The device for judging the type of liquid inside a container according to any one of Claims 1 through 5, wherein said container supporting means adjusts, in accordance with the size of said container, the area of overlap of said container with said plate electrodes, as projected from the normal direction perpendicular to a first plate electrode, which, among said two plate electrodes, is positioned at the side of said container.

[Claim 13] The device for judging the type of liquid inside a container according to Claim 12, wherein said container has a cylindrical column, rectangular column, or spherical outer shape and is supported on said container supporting means with the columnar direction of said cylindrical column or rectangular column being set parallel to said first plate electrode, and

said container supporting means has an inclined surface of an acute angle with respect to said first plate electrode,

and said area of overlap of said container with said plate electrodes is adjusted according to the size of said container by a bottom edge part of said rectangular column or cylindrical column container or the outer peripheral surface of said spherical shape container contacting said inclined surface.

[Claim 14] The device for judging the type of liquid inside a container according to Claim 12, wherein said container has a cylindrical column, rectangular column, or spherical outer shape and is supported on said container supporting means with the columnar direction of said cylindrical column or rectangular column being set parallel to said first plate electrode, and

said container supporting means has a stairs-like member, which rises in a direction parallel to said first plate electrode, and said area of overlap of said container with said plate electrodes is adjusted according to the size of said container by the bottom surface of said rectangular column or cylindrical column container contacting a step of said stairs-like member or the outer peripheral surface of said spherical shape container contacting an edge part of said step.

[Claim 15] The device for judging the type of liquid inside a container according to Claim 6, 7, 8, 10, 12, 13, or 14, wherein said container supporting means is inclined at a predetermined angle with respect to a level surface with the

relative positions of said container supporting means and said two plate electrodes being maintained.

[Claim 16] The device for judging the type of liquid inside a container according to any one of Claims 1 through 15, further comprising:

- a sensor, detecting whether or not said container is positioned on said container supporting means;

- a means for detecting the amount of change between the capacitance of said capacitor or the oscillation frequency of said oscillation circuit when said container is not positioned on said container supporting means and the capacitance of said capacitor or the oscillation frequency of said oscillation circuit when said container is positioned on said container supporting means; and

- a notification means, notifying whether or not said change amount is greater than a predetermined threshold value.

[Claim 17] The device for judging the type of liquid inside a container according to Claim 16, further comprising:

- a storage means, recording the capacitance of said capacitor or the oscillation frequency of said oscillation circuit when said container is not positioned on said container supporting means; and

- a means for periodically renewing said capacitance or



oscillation frequency recorded in said storage means.

[Claim 18] A method for controlling a device, which is for judging the type of liquid inside a container and comprises: a plate capacitor, having two plate electrodes positioned in opposing manner; a container supporting means, holding, in a region besides the region sandwiched by said two plate electrodes, a non-conductive container that can contain a liquid in the interior thereof; a means for detecting the capacitance of said capacitor or the oscillation frequency of an oscillation circuit containing said capacitor; and a sensor, detecting whether or not said container is positioned on said container supporting means; said method comprising:

- a first detection step of detecting that said container is not positioned on said container supporting means;

- a first measurement step, wherein, given the detection of said first detection step, the capacitance of said capacitor or the oscillation frequency of said oscillation circuit is measured;

- a second detection step of detecting that said container is positioned on said container supporting means;

- a second measurement step, wherein, given the detection of said second detection step, the capacitance of said capacitor or the oscillation frequency of said oscillation circuit is

measured; and

a step of notifying whether or not the difference between the capacitance or oscillation frequency measured in said first measurement step and the capacitance or oscillation frequency measured in said second measurement step is greater than a predetermined threshold value.

[Claim 19] A method for controlling a device, which is for judging the type of liquid inside a container, comprises:  
a plate capacitor, having two plate electrodes positioned in opposing manner; a container supporting means, holding, in a region besides the region sandwiched by said two plate electrodes, a non-conductive container that can contain a liquid in the interior thereof; a third electrode, besides said two plate electrodes, that is an electrode outside said container and is set along a portion of said container at which said liquid inside said container is retained due to gravity; a means for detecting the capacitance of said capacitor or the oscillation frequency of an oscillation circuit containing said capacitor; and a sensor, detecting whether or not said container is positioned on said container supporting means; and has either a first arrangement, wherein the voltage of said third electrode differs in either or both of the absolute value and the phase with respect to the voltage of a first plate electrode that

is positioned at said container side of said capacitor, or a second arrangement, wherein the voltage of said the third electrode is equal in voltage to the second plate electrode of said capacitor that opposes said first plate electrode, said method comprising:

- a first detection step of detecting that said container is not positioned on said container supporting means;

- a first measurement step, wherein, given the detection of said first detection step, the capacitance of said capacitor or the oscillation frequency of said oscillation circuit is measured;

- a second detection step of detecting that said container is positioned on said container supporting means;

- a second measurement step, wherein, given the detection of said second detection step, the capacitance of said capacitor or the oscillation frequency of said oscillation circuit is measured; and

- a step of notifying whether or not the difference between the capacitance or oscillation frequency measured in said first measurement step and the capacitance or oscillation frequency measured in said second measurement step is greater than a predetermined threshold value.

[Claim 20] The method for controlling a device for judging

the type of liquid inside a container according to Claim 18 or 19, further comprising:

a third measurement step of measuring the capacitance of said capacitor or the oscillation frequency of said oscillation circuit after the elapse of a predetermined time after said first measurement step; and

a step, wherein, if the absolute value of the difference between the capacitance or oscillation frequency measured in said first measurement step and the capacitance or oscillation frequency measured in said third measurement step is greater than a predetermined value, said first measurement step and said third measurement step are repeated, and if the absolute value of said difference is not greater than the predetermined value, the detection of said container being positioned on said container supporting means is awaited and the steps from said first measurement step onward are repeated after the elapse of a predetermined time.